Science & Environmental Education:

Community Connections, Impacts & Actions

4th Grade Curriculum

How Do Humans Impact Erosion Rates Caused By Water, Wind, Ice, Or Vegetation?

Purpose of ENVIRONMENTAL EDUCATION

Environmental education is lifelong learning process that leads to an informed and involved citizenry having the creative problem-solving skills, scientific and social literacy, ethical awareness and sensitivity for the relationship between humans and the environment, and commitment to engage in responsible individual and cooperative actions.

By these actions, environmentally literate citizens will help ensure an ecologically and economically sustainable environment.

4th Grade Curriculum

The following two-week integrated unit is designed for teachers and students to engage in an interdisciplinary study of science and the environment through literacy and math lessons. The lessons and activities are not meant to be done in isolation, but in support of and during literacy and math time.

Each lesson has a suggested structure with room for teachers to infuse more interactive play, discussions, or videos as well as adjust pacing as makes sense for their class. The summative assessment is designed to assess the NGSS, with several formative checks along the way for CCSS, used as the teacher sees fit.

This unit connects to the specific literacy theme of “Relationships.” This mini-unit is part of a larger Earth and Human Activity Unit where students will learn about how human activity has impacted the Earth by exploring the essential question: *What relationship do individual communities have with protecting the Earth’s resources and environment?*

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Students in Wisconsin will be able to:

- Develop and connect with their sense of place and well-being through observation, exploration and questioning.
- Assess how diversity influences health and resilience of natural and cultural systems.
- Analyze the interactions and outcomes of cycles and flows in natural and cultural systems.
- Analyze the dynamic balance between natural and cultural systems.

This integrated unit uses NGSS an CCSS as the backbone to planning and infusing environmental education standards into the curriculum.

Wisconsin Standards for Environmental Literacy and Sustainability

NGSS PERFORMANCE EXPECTATION	DISCIPLINARY CORE IDEAS	SCIENCE AND ENGINEERING PRACTICES	CROSS CUTTING CONCEPTS	COMMON CORE ELA	COMMON CORE MATH
4-ESS2-1 Make observations and/or measurements to provide evidence of the effects of weathering or the rate of erosion by water, ice, wind, or vegetation.	Rainfall helps to shape the land and affects the types of living things found in the region. Water, ice, wind, living organisms, and gravity break rocks, soils, and sediments into smaller particles and move them around.	Make observations and/or measurements to produce data to serve as a basis for evidence for an explanation of a phenomenon.	Cause and effect relationships are routinely identified, tested, and used to explain change.	CSS.ELA-LITERACY.RI.4.7 Interpret information presented visually, orally, or quantitatively (e.g., in charts, graphs, diagrams, time lines, animations, or interactive elements on web pages) and explain how the information contributes to an understanding of the text in which it appears. CCSS.ELA-LITERACY.W4.1 Write opinion pieces on topics or texts, supporting a point of view with reasons and information.	CCSS.MSATH.CONTENT.4.MD.A.1 Know the relative sizes of measurement units within one system of units including km, cm, kg, g, lb, oz,; l, ml; hr, min, sec. Within a single system of measurement, express measurements in larger unit in terms of smaller unit. Record measurement equivalents in a two-column table.

UNIT OUTLINE

Day 1: What is Soil?

Day 2: What is Soil Made of?

Day 3: Soil is Alive?!

Day 4 & 5: Weathering and Erosion

Day 6: What Changes the Land? Field Experience

Day 7: What Happens to Eroded Soil?

Day 8: Pollution Caused by Erosion

Day 9: Solutions to Human Caused Erosion

Day 10: Call to Action

Day 1 WHAT IS SOIL?

Discussion: How do we use soil?

Pose the question *How do you use soil?*

Discuss how humans use soil in everyday life, using the resources below as examples.

Watch: *The Importance of Soil*

Read: *A Handful of Dirt* by Raymond Bial

Activity: *Starting With Soil*

Discussion: *Apple Investigation*

In groups, or as a teacher demonstration, use Part 1 of this activity from IUPUI's Population Connections to model the amount of arable land on Earth. Introduce the concepts brought up in the discussion section and have the student groups discuss the different aspects of each question.

Science Journal Prompt:

Have students write a short paragraph about what they learned from the apple investigation.

Activity: Soil Horizons

Using *Legos* or *Dirt Pudding*, have students explore the different soil horizons and what their functions are.

Science Journal Prompt:

Have students create an anchor chart using the *RAN Strategy* to examine the essential question: *How do humans impact erosion rates caused by water, wind, ice, or vegetation?* At the end of each day, have students update their anchor chart, add what they have learned, and connect back to the essential question. Students should use the discussions from today's lesson to chart how people use soil.

Day 2

WHAT IS SOIL MADE OF?

Activity: *BrainPOP Soil*

Discussion: **Soils- Sand, Silt and Clay**

See a real soil profile and learn the difference between sand, silt and clay. Understand how soils are formed and do an experiment to see how quickly they can erode.

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Activity: *Properties of Soils*

Use this two-day activity to explore the differences in soil types and characteristics.

Science Journal Prompt:

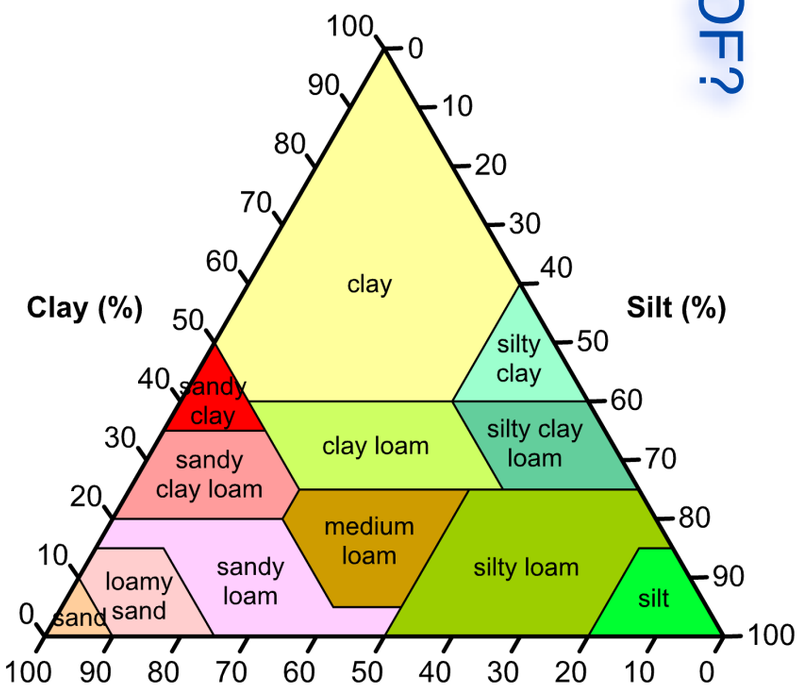
Have students compare and contrast soil types and the different properties of each soil.

Discussion: **Different types of soils**

Introduce and discuss the different types of soil and how soil is classified. Use the texture triangle to describe different samples of soils based on their properties.

Science Journal Prompt:

Have students list properties of sand, silt, and clay. Students should compare and contrast different soil types and their properties. Have students update their anchor charts to form connections on how soil is used and the effects humans have on soil.



Day 3 SOIL IS ALIVE?!

Read: *Leaf Litter Critters* by Leslie Bulion or *Rotten Pumpkin* by David M. Schwartz

Discussion: What is compost?

Discuss the basics of compost- what is it, how it is created, and how it helps soil.

Watch: *Worms At Work* and *The Living Soil Beneath Our Feet*

Activity: *Rot is Hot: Composting*

Learn about nature's decomposers and how they create compost. Find out the four critical components of making your own compost and the role compost plays in reducing soil erosion. Observe live compost microorganisms through magnification and microscopes when seasonally available. **Optional Extended Activity:** *Investigating Compost*

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Science Journal Prompt:

What are the benefits of composting?

Have students answer the question and give supporting details.

Activity: *Planting with compost*

Use the Wake County Environmental Services Compost Lesson 4: *Planting with Compost* to demonstrate how compost benefits soil quality.

Discussion: How does compost help prevent erosion?

In groups, have students brainstorm how compost could prevent erosion. Have them list their ideas in their science journals and present on one way compost helps prevent erosion, using supporting details.

Science Journal Prompt:

During the presentations have students summarize each presentation.

Day 4&5

WEATHERING AND EROSION

Activity: BrainPOP *Erosion* and *Weathering*

Discussion: **The rock cycle**

Explain what the rock cycle is and discuss how different rocks are formed. As a class, use the Annenberg Learner interactive, *Rock Cycle*, to go over different types of rocks and how they are formed.

Activity: *Weathering and Erosion*

Using this *Understanding Science* lesson, have students, in a group or pairs, explore the processes and effects of weathering and erosion. At each station, students should create a hypothesis and test it.

Discussion: **Weathering and erosion presentations**

Using the weathering and erosion activity, have the groups/pairs prepare a presentation on their findings from one or two of the stations. This presentation should include: background on their station(s), their hypothesis about what would happen/ what type of weathering would take place, their findings from the experiment(s), and where in real life could they see the weathering that took place.

Science Journal Prompt:

H*ow do weathered rock pieces move from one place to another?*

Where have you seen examples of erosion in the community?

Have students answer the questions and give supporting evidence. Have students relate their answers back to the essential question anchor chart the students created on the first day and if necessary, modify their chart. If you decide to use the *notebook templates*, deposition will be discussed later on.

Day 6

WHAT CHANGES THE LAND?

FIELD EXPERIENCE

Discussion: What types of erosion will we see today?

Have students in groups discuss what types of erosion they think they will see on their visit to Lapham Peak. Students should connect their discussions back to the previous day's exploration into the different types of erosion and weathering. Groups will prepare and present a statement on the types of erosion they think they will see.

Field Experience: What Changes the Land?

Students will interact with the environment directly, applying their understanding of weathering and erosion to landforms in Waukesha County that have been directly affected by glaciers and soil erosion. Students will cycle through activities such as: nature hikes, soil studies, raindrop tag, glacier investigations, and more!

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Science Journal Prompt:

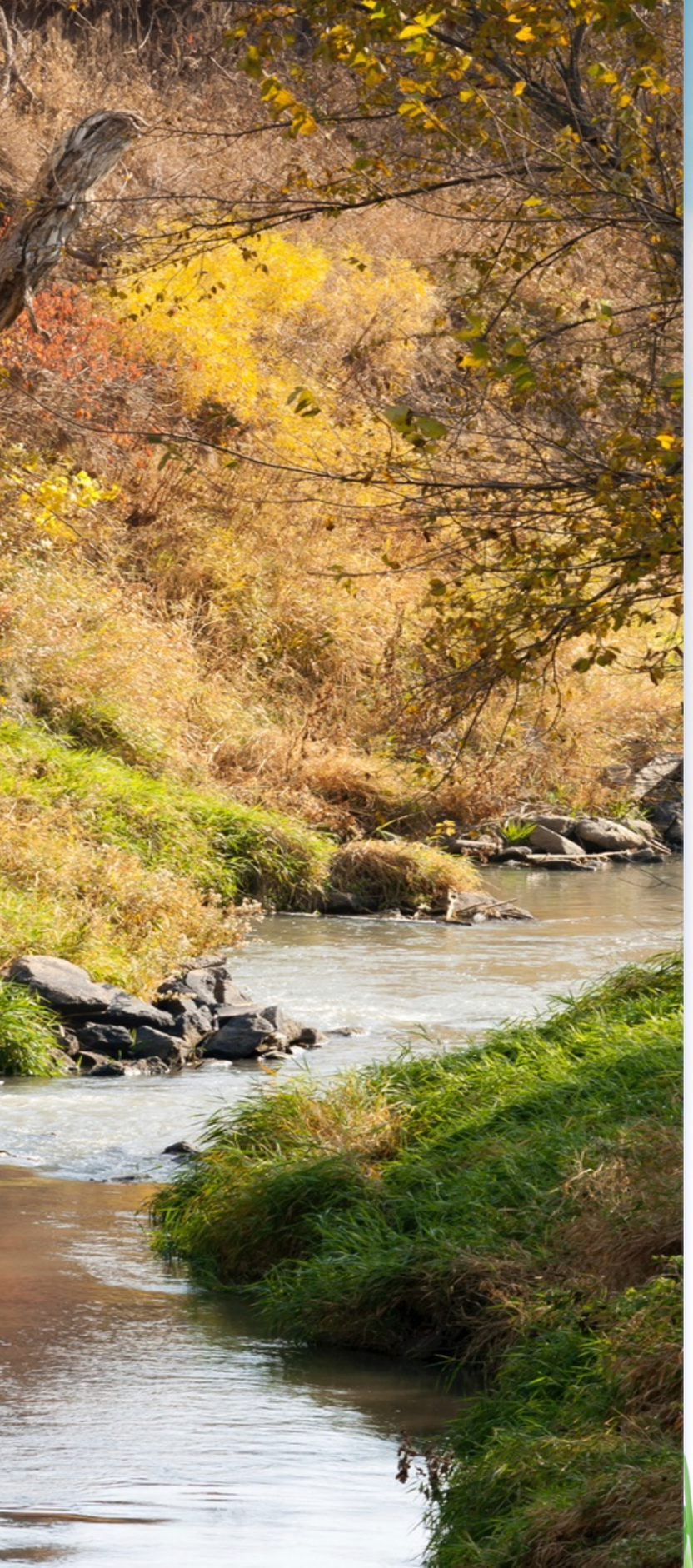
Throughout the day, have students sketch or describe the different types of weathering they see throughout the park and detail the possible causes of the erosion. Have them also notice and describe if they saw anything to prevent or control erosion. Have students update their anchor charts to form connections on how soil is used and the effects humans have on soil.

Discussion: What happens to eroded soil?

Introduce the next day's topic *What Happens To Eroded Soil?*

Pose questions asking students to think about what happens to eroded soil.

All SDW teachers should schedule this program directly through SDW Env. Ed.



Day 7

WHAT HAPPENS TO ERODED SOIL?

Discussion: What is deposition?

In groups, have students review their findings from their visit to Lapham Peak. Have students discuss what happens to soil when it is eroded and where it goes. Discuss with students potential issues for areas where deposition occurs.

Activity: Stream Table (*Setup instructions*)

Using the Rivers *Stream Table Lab*, have students work in groups to discover how erosion, weathering, and deposition occur. Have students modify their stream tables in attempts to increase or decrease the amount of erosion that occurs. The stream table lab has options for the adjustment of water flow and other modifications such as: fake trees/shrubs, pavement simulators (blocks of non-porous materials), and buildings. Students should make predictions in their science journals before beginning each trial run including: if erosion will occur, how fast it will occur, and what modifications will cause the most/least erosion. During each trial, students should draw the results of their experiment, they will use this information to compare the trials during their presentations.

Science Journal Prompt:

Have students summarize their findings from the stream table experiment and present their findings to the class.

Day 8

POLLUTION CAUSED BY EROSION

Read: *Soil Erosion and How to Prevent It* by Natalie Hyde

Discussion: How does weathering and erosion affect me?
Through out the days, students should have been filling out the anchor chart relating to the essential question from Day 1. Using this chart, ask students to add a section based on what they have learned to the anchor charts and to move the sticky notes to create a more cohesive chart.

Discussion: What are the effects of erosions on human populations?
As a class, read *California City's Cliffs Crumbling Into Sea, Leaving People Homeless*. Have students search for other stories where the erosion of soil has affected populations. Have students prepare a summary what happened, why erosion occurred, and the solutions used to curb the erosion.

Activity: Explore the Discovery Education animations and games focused on erosion: *Erosion Animation*, *In-Depth Erosion Animation*, and *River Rafting and Erosion*

Science Journal Prompt:
Using the their anchor charts and their science journals, have students answer the following questions and back their claims with supporting evidence:
What causes erosion?
How do humans impact erosion?
How can we help prevent erosion?

Day 9 SOLUTIONS TO HUMAN CAUSED EROSION

Discussion: **How can we prevent erosion?**

Have students research the different techniques used to mitigate erosion. Have students present their findings to others in individual groups or to the class.

Activity *Chalk Talk*

In groups, have students describe different aspects of erosion. Pose questions such as: *What is soil? What is Weathering? What are the different types of weathering? What is erosion? How is erosion and weathering different/similar? Where have we seen weathering/erosion? What problems can erosion cause? What are can people do to prevent erosion?* Have student use their anchor charts and science journals as supporting evidence for the claims they make during this chalk talk.

Science Journal Prompt:

Students should summarize the claims their group agreed upon during the chalk talk.

Discussion: **Chalk talk check in**

After the chalk talk, have students summarize the claims and answers for each group. Have students discuss with the class how the group decided on the answers to the posed questions.

Science Journal Prompt:

How can you help with the effects humans have on erosion?

Have students answer the question and use supporting evidence to back up their claim.

Day
10

CALL TO ACTION

Activity: Using examples of erosion, such as these *slides*, have students work in groups to:

- Identify the cause(s) of erosion in each picture and describe what methods should be implemented to prevent the erosion.
- Chose one of the slides and design an action plan on how best to mitigate the amount of erosion occurring in the picture.
- Chose a different example of weathering and erosion that the students have seen in this unit, write the causes of that example, and an action plan to prevent the erosion from occurring.

The groups should prepare and present their finding to the class. During this presentation, students should demonstrate that they understand the relationship between humans and erosion.

Science Journal Prompt:

As an individual assessment, have students write a reflection on the relationship between weathering and erosion and their causes. This should include how people can affect weathering and erosion and answer the following questions: *How can people reduce their impact on erosion? What can people do to prevent erosion from happening around home or in the community?*

	4	3	2	1
4-ESS2-1: Make observations and/or measurements to provide evidence of the effects of weathering or the rate of erosion by water, ice, wind, or vegetation.	I can design an action plan to help solve the effects of different types of erosion.	I can make observations to provide evidence of the effects of erosion by water, ice, wind, or vegetation and what caused the erosion.	I can make observations to provide evidence of the effects of erosion by water, ice, wind, or vegetation.	I can make observations of the effects of erosion by, water, ice, wind or vegetation.

Resources

CLASSROOM RESOURCES

Request A Program Online!

Books:

Magic School Bus Meets the Rot Squad
Erosion Books

Videos:

How Compost Is Made

Activities:

Soda Bottle Worm Farm
Compost: A Scientific Investigation
Macroinvertibrate Manor
Soils in a Cup
WindTunnel App
Erosion Jeopardy

Websites:

Geology For Kids

No endorsement of any business is intended.

Waukesha County, Waukesha School District, and Carroll University have collaborated to create a comprehensive, interdisciplinary K-12 science and environmental education curriculum fully integrated with NGSS Science and Literacy standards.

The goal of this curriculum is to create more scientifically and environmentally literate citizens with the ability to understand and critically assess current scientific and environmental issues, along with a desire and ability to engage in these issues. This project focuses on improving efficiencies through program coordination among partners as well as building comprehensive approaches.